

On a Collection of Japanese Cheilostomatous Bryozoa. I.

By

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With Plate VI.

As a result of our studies on the Cheilostomatous Bryozoa of Japan, we propose in this paper to report on the Cellulariidae and the Bicellariidae. Both the families are well represented in the Japanese waters, altogether some seven genera and twenty-eight species having so far come to our knowledge. Of the latter, ten seem to be new to science. The collection, including the types, is preserved in the Science College, Imperial University of Tokyo.

Cellulariidae Johnston (pars) 1849.

Key to the genera.

- 1. Zoarium jointed 2.
- 1. Zoarium not jointed..... 3.
- 2. Zoecia not exceeding 10 in number to one internode; vibracula absent.....
..... *Menipea*.
- 2. Zoecia not exceeding 40 in number to one internode; vibracula present, not
covering the dorsal surface of zoecium..... *Scrupocellaria*.
- 3. Vibracula present, covering the dorsal surface of zoecium *Caberea*.

Menipea Lamouroux 1812.

Key to the species.

- 1. Zoecia usually 3 to an internode; without frontal avicularia 2.
- 1. Zoecia numerous on internode; with frontal avicularia..... 3.

- 2. Scutum not divided *M. occidentalis*.
- 2. Scutum divided *M. occidentalis*, var. *datalinensis*.
- 3. Scutum present *M. longispinosa*.
- 3. Scutum not present 4.
- 4. Zoecium with a single spine *M. sympodia*.
- 4. Zoecium with two or more spines *M. sympodia*, var. *sagamiensis*.

1. *Menipea longispinosa*, n. sp.

Pl. VI., fig. 3; textfig. 1.

Zoarium forming a white delicate tuft, 27 mm. in height, dichotomously branching. Internodes consisting of a variable number (4-10) of zoecia, with distinct joints of a faintly yellowish colour. Zoecia biserial, alternate, rather loosely connected laterally, attenuated below, convex in front; their aperture elliptical, about one-third as long as

zoecium, with slightly thickened marginal wall. Zoecium provided with very long and delicate curved spines segmented at base: three of them occur close together on the upper outer angle of the aperture, projecting sideways; a fourth, situated lateral to the lower end of aperture, is obliquely distally directed; a fifth, similarly directed may arise from a somewhat lateral point on

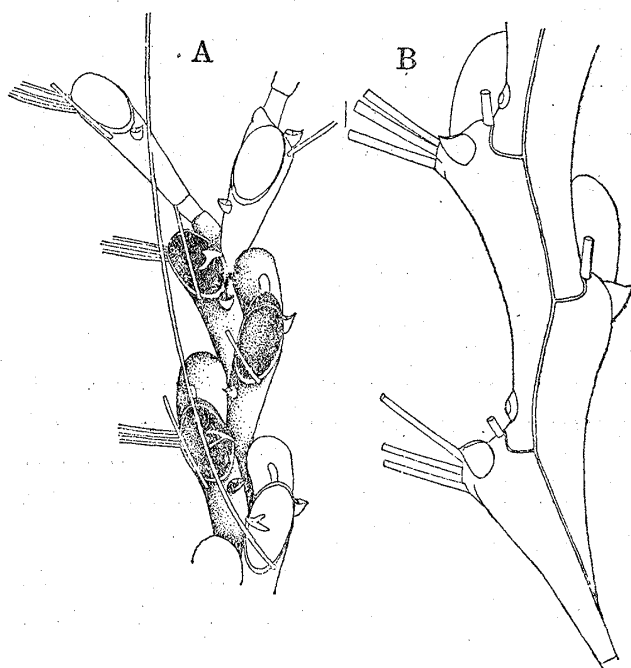


Fig. 1. *Menipea longispinosa*, n. sp.

- A. Portion of a branch enlarged, showing coecium and apertural spines. Frontal view. $\times 32$.
- B. Dorsal view of zoecia, showing root-chambers and the position of dorsal spines. $\times 57$.

the anterior end of zoecium. The last mentioned spine is limited in its occurrence to the zoecia which constitute the outer branchlet of a biforked branch. Scutum small, commonly bifid, though not unfrequently trifid. Lateral avicularium with the triangular mandible hooked, sharply pointed at the end; present on each zoecium at the upper outer angle, just behind the three laterally outstanding spines. Frontal avicularium small, raised, with triangular transversely directed mandible; present on each zoecium to one side below the aperture. Oecium prominent, rounded, slightly expanded anteriorly, smoothly surfaced, with a semi-orbicular thin area marked out at the basal margin. Unsegmented rootlets given off from a small projection with elliptical peristome and situated near the inferior end of zoecium on the dorsal side.

Of this new species, there exist in the collection: a large fragment from Okinosé in the Sagami Sea, depth 312 fms., and a complete zoarium attached on a Brachiopod, from off Ukishima (Prov. Izu?). The species is characterized by the slender and delicate nature of the parts of colony and especially by the loose arrangement of zoecia, which latter character seems to indicate relationship with Bicellarian genera.

2. *Menipea occidentalis* Trask.

Menipea occidentalis, Trask 1857, Proc. Cal. Acad. Sci., 113, pl. iv, fig. 4 — Robertson 1905, Univ. Calif. Publ. Zool., vol. II, 254, pl. vi, figs. 22-25.

Menipea compacta, Hincks 1882, Ann. Mag. Nat. Hist., 5, X, 461. — Hincks 1884, Ann. Mag. Nat. Hist., 5, XIII, 208, pl. ix, fig. 8.

A few large colonies referable to typical *M. occidentalis* are contained in the collection. They were obtained from the shallow water near Misaki, in the Yokohama harbour and at Ôzu in the Ebaraki prefecture.

3. *Menipea occidentalis*, var. *catalinensis* Robertson.

Menipea occidentalis, var. *catalinensis*, Robertson 1905, Univ. Calif. Pub. Zool., vol. II, 255, pl. vii, figs. 26, 27.

This form is quite common in shallow water near Hakodate,

attached on stones and shells. Compared with the description and figures given by Robertson of var. *catalinensis*, the specimens before us differ somewhat in the less number of zoöcia in internodes. On main and secondary branches each internode is made up of three zoöcia, and on tertiary branches it consists of five or seven zoöcia, while in the Catalina form, all the internodes should contain from five to six zoöcia. In main features of the scutum the Hakodate specimens seem to agree entirely with those from Catalina.

4. *Menipea sympodia*, n. sp.

Pl. VI., fig. 1; textfig. 2.

Zoarium delicate, forming a tufted growth, 40–60 mm. high, greyish white, attached to substratum by numerous root-fibres. These are given off from either the lateral walls or the dorsal wall of the branches, in both cases extending downwards along the dorsal surface; they are closely adherent and form a bundle. Branches slender, somewhat depressed, forming pinnate ramifications; the mode of branching regularly sympodial; each pinnate ramification consisting, as it appears, of an axis from which secondary branches arise in alternate disposition, these bearing tertiary branches in a like manner. Joints distinct, yellowish in colour, arising from distinct chambers. Zoöcia elongate, broad, slightly truncated above, attenuated below; their aperture suboval, occupying usually less than quarter length of zoöcium, with thin margin, armed with a stout long (about 2 mm.) spine on the upper inner angle and frequently also on the outer. Scutum is unknown, probably absent altogether. Lateral avicularia generally present and occasionally absent, placed at the upper outer angle of zoöcium, widened above, with a hooked triangular mandible directed transversely. Frontal avicularia unusually elongate, trumpet-shaped, placed immediately below the aperture, projecting upwards and forwards over and reaching beyond the middle of this; beak pointed,

with triangular mandible. Oöcia situated usually on certain internode of terminal branches, large, semi-orbicular, rounded above, the lower margin projecting like a curved penthouse; surface smooth with faintly radiate lines and with a thin-walled area marked out from the base. Rootlets given off by certain zoöecia from lateral wall near base.

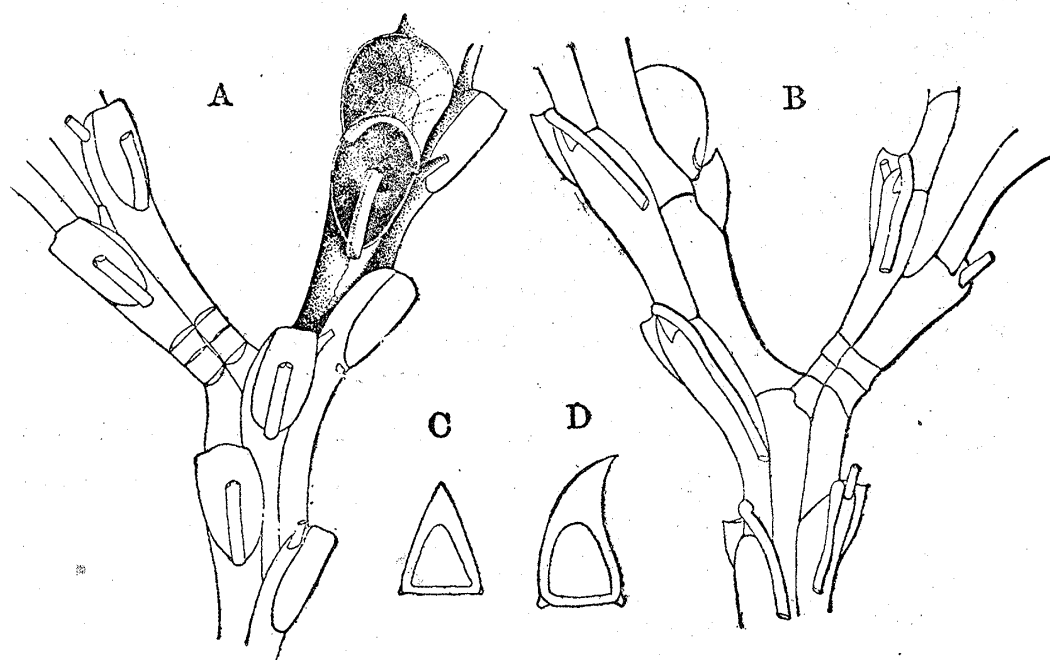


Fig. 2. *Menipea sympodia*, n. sp.

- A. Portion of a branch at the bifurcation, showing peculiar frontal avicularia and an oöcium. Frontal view. $\times 32$.
- B. Same to show lateral avicularia and the position of projecting rootlets. Dorsal view. $\times 32$.
- C. Mandible of frontal avicularium. $\times 160$.
- D. Mandible of lateral avicularium. $\times 160$.

This new species is represented in the collection by a large colony, obtained in the Sagami Bay, off the coast of Izu, from a depth of about 250 fms. Remarkable are the delicate structure of the colony, the sympodial arrangement of the branches, and the peculiar trumpet-shaped frontal avicularia, which characters may serve to easily distinguish the species.

5. *Menipea sympodia*, var. *sagamiensis*, n. var.

Pl. VI., fig. 2; textfig. 3.

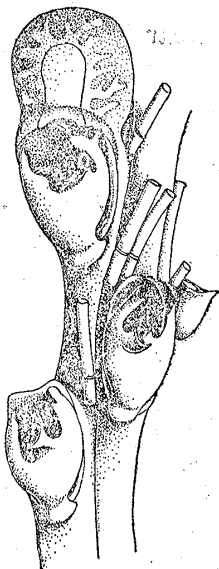


Fig. 3. *Menipea sympodia*, var. *sagamiensis*.
Frontal view. $\times 32$.

At Yodomi in the Sagami Bay, from a depth of 321 fms., was dredged a specimen which may be considered to represent a variety of the species just described. In general appearance, it is quite like the typical species, but differs from it in the peculiar shape of frontal avicularia and in the better development of spines. The frontal avicularia are developed usually on every zoecium and present a complicated shape in that their basal parts are prolonged on both sides into broad horn-like projections, either simple or bifid at tip, extending along the inner apertural border. The avicularium covers up the greater part of the aperture. Scutum unknown. The spines arise from the same place as in the typical form, but are more numerous and more strongly developed.

Scrupocellaria van Beneden 1844.

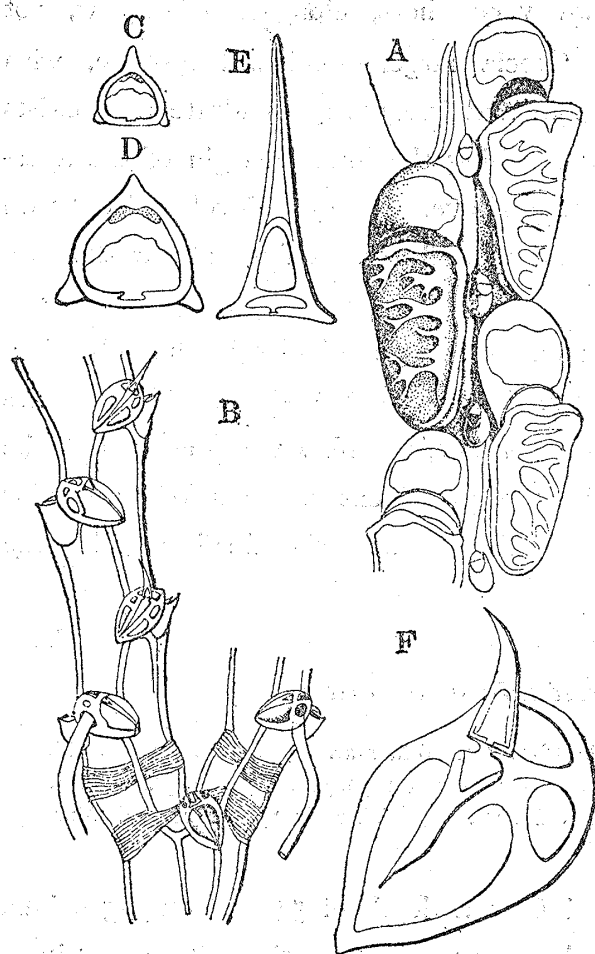
Key to the species.

- | | |
|---|-------------------------|
| 1. Vibracular chamber on all zoecia | 2. |
| 1. Vibracular chamber not on all zoecia | 4. |
| 2. With frontal avicularia | 3. |
| 2. Without frontal avicularia | <i>S. macandrei</i> . |
| 3. Zoecium with five spines | <i>S. diadema</i> . |
| 3. Zoecium with three spines | <i>S. scrupaea</i> . |
| 4. Zoecial aperture without spines | <i>S. aviculariae</i> . |
| 4. Zoecial aperture with spines | <i>S. scabra</i> . |

6. *Scrupocellaria avicularia*, n. sp.

Pl. VI., fig. 4; textfig. 4.

Zoarium erect, dichotomously branching, forming a tufted growth

Fig. 4. *Scrupocellaria avicularia*, n. sp.

- A. Portion of a branch in frontal view, showing oöcia, frontal avicularia and operculum. $\times 48$.
- B. Dorsal view of the bifurcating parts of a branch, to show the position of vibracula and the origin of rootlets. $\times 32$.
- C. Mandible of frontal avicularium. $\times 150$.
- D. Mandible of lateral avicularium. $\times 150$.
- E. Vibraculum. $\times 150$.
- F. Vibracular chamber. $\times 120$.

30–40 mm. in height, glossy white. Internodes stiff, consisting of from 5 to 16 or more zoöcia. Joints bright yellowish. Zoöcia arranged alternately in two series, elongate, widened above, gradually narrowed below; their aperture oval, with thin margin, unarmed, occupying more than half the front. Scutum very large, exceeding the orifice in area, widened and raised above, slightly narrowed below, with irregular vein-like sculpturing on surface. Lateral avicularia small, usually present on every zoöcia, placed at the upper outer angle on the dorsal surface. Frontal avicularia rounded, raised, with short and broad mandibles, present on all zoöcia, placed on the inner apertural margin a little below the middle and at

the same level as the peduncle of the scutum of adjacent zoecium. Vibracular chamber wedge-shaped, slightly swollen in the middle and pointed at the distal extremity; placed at the outer lower corner of zoecium on the dorsal side, stretching obliquely downwards over the back of zoecium. Vibraculum very short, elongate triangular, not exceeding the cell in length. Oecia large, prominent, globose, with smooth surface on which a thin and irregularly quadrate area exists at base; expanded and nearly reaching the lower margin of the aperture of the zoecium situated next above. Rootlets developed only on zoecia in the lower parts of zoarium and given off from near the base of vibracular chamber.

This new species is based on two large colonies in the collection. Both were obtained from a depth of 78 fms. at Yodomi. The species seems to agree closely with *Scrupocellaria scabra* van Beneden in the general habit of growth and in the prominent features of vibracular appendages, but differs from it in the absence of oral spines and in the larger size of zoecia.

7. *Scrupocellaria diadema* Busk.

Scrupocellaria diadema, Busk 1852, Cat. Brit. Mar. Poly., I, 24, pl. xxviii, figs. 1-3.—Busk 1852, Voy. Ratt., I, 370.—Ortmann 1890, Jap. Bry., 22, pl. i, fig. 4.—Thornely 1905, Rep. Pearl Oyst. Fish., IV, 109.—Thornely 1907, Rec. Ind. Mus. vol. I., 181.

Numerous colonies collected from a depth of 54 fms., off Jôgashima, in the Sagami Sea, are referable to the above species. The margin of zoecial aperture is usually armed with five slender spines, this number being not variable as in the specimens previously described from other localities. The species resembles *Scrupocellaria varians* H. in many respects, but may be easily distinguished from it by the greater thickness of apertural margin, the more numerous spines and the different position and shape of lateral avicularia.

8. *Scrupocellaria macandrei* Busk.

Scrupocellaria macandrei, Busk 1852, Cat. Brit. Mar. Poly., I, 24, pl. xxiv, figs. 1-3.—Busk 1861, Quart. Journ. Mic. Sc., n. s., I, 77.—Busk 1884, Chall. Rep., vol. X, pt. XXX, 23.—Heller 1867, Bry. Adr., 87.—Phillips 1899, Will. Zool. Res., pt. IV, 442.—Calvet 1906, Exp. Scient. Trav. Talism., pt. VIII, 375.—Waters 1913, Proc. Zool. Soc., 477, pl. lxviii, figs. 5, 6.

There exist in the collection numerous colonies which may be identified with the above species. The localities are: off Odawara (120 fms.); off Jôgashima (50-70 fms.); Senkai Bay, Tsushima I. (depth unknown). All the specimens differ from those described by Waters from Zanzibar under the same name, in the larger number of inner oral spines and in the shorter groove of vibraculum. In the specimens on hand, the groove of vibraculum stops short of the median line of zoecium, while in the Zanzibar specimens it should reach the median line. The inner oral spines situated near the peduncle of scutum always number two, instead of being single.

9. *Scrupocellaria scabra* (van Beneden).

Cellaria scabra, van Beneden 1849, Bull. Brux., vol. XVI, I, 73.
Scrupocellaria scabra, Hincks 1880, Hist. Brit. Mar. Poly., 48.—Norman 1868, Quart. Journ. Mic. Sc., n. s., VIII, 214.—Busk 1882, Jour. Linn. Soc., XV, 231.—Hincks 1888, Ann. Mag. Nat. Hist., 6, III, 427.—Bidenkap 1897, Zool. Jahrb., X, 614.—Bidenkap 1900, Fauna Arct., I, 507.—Waters 1903, Journ. Linn. Soc., XXVIII, 54, pl. vii.—Robertson 1900, Proc. Wash. Acad. Sci., II, 318, pl. xix, figs. 3, 4.—Norman 1903, Ann. Mag. Nat. Hist., 7, XI, 579.—Osburn 1912, Proc. Nat. Mus. U.S.A., 43, 277.—Osburn 1912, Bull. Bur. Fish., 1910, XXX, 223, pl. xxi, fig. 20, pl. xxxi, fig. 95.

Numerous colonies which may be identified with the above species are found in the collection. They hail from the shallow water near Hakodate. They are attached to stones and shells.

10. *Scrupocellaria scrupea* Busk.

Scrupocellaria scrupea, Busk 1851, Ann. Mag. Nat. Hist., 2, VII, 83.—Busk 1852, Cat. Brit. Mar. Poly., I, 24.—Heller 1867, Bry. Adr., 86.—Norman 1868, Quart. Journ. Mic. Sci. n. s., VIII, 214.—Hincks 1880, Hist. Brit. Mar. Poly., 50.

pl. vii, figs. 11-14.—McCoy 1886, Prod. Zool. Vict., decade XIII, 101, pl. cxxvi, fig. 8.—Waters 1887, Ann. Mag. Nat. Hist., 5, XX, 88.—MacGillivray 1887, Cat. Mar. Poly. Vict., 14.—Ortmann 1890, Japan. Bry., 21, pl. i, fig. 3.—Jullien 1903, Result. Camp. Scient., XXIII, 34, 125.—Thornely 1907, Rec. Ind. Mus., vol. I, 180. *Cellularia scruposa*, Alder 1857, Trans. Tyn. Fill. Club., sep. 58.—Waters 1879, Ann. Mag. Nat. Hist., 5, III, 117.

There exist in the collection a few dried fragments of this species. They were all obtained at Ojiya, on the island of Ōshima or Vries Island in the Sagami Sea.

***Caberea* Lamouroux 1816.**

Key to the species.

1. Zoecia biserial 2.
1. Zoecia multiserial 3.
2. Zoecium without lateral avicularia *C. gigantoceras*.
2. Zoecium with lateral avicularia *C. darwini*.
3. Zoecial aperture with spines 4.
4. Lateral avicularia present *C. rudis*.
4. Lateral avicularia not present *C. rudis*, var. *minor*.
5. Zoecial aperture with transverse spines *C. climacina*.
5. Zoecial aperture without transverse spines *C. lata*.

II. ***Caberea climacina* Ortmann.**

Caberea climacina, Ortmann 1890, Jap. Bry., 22, pl. I, fig. 6.

A large well-grown colony, which was obtained at Yodomi (78 fms.) in the Sagami Bay, seems to be referable to Ortmann's *Caberea climacina*. The species closely resembles *Caberea lata* Busk, a species which also occurs in the Sagami Sea. It was pointed out by Ortmann that the former may be distinguished from the latter by the presence of a transverse apertural spine in intermarginal zoecia and by the total absence of lateral avicularia. We should note that, while the latter negative character is a useful one, the former can not always be relied upon for the differential purpose, since we find that in the specimen now before us, the zoecia in the distal parts of the zoarium

are mostly entirely destitute of the spine in question. On the other hand, we have noticed that, while in *C. lata*, the zoöcial aperture is elliptical and simply margined, in the specimen under consideration of *C. climacina* it is of a somewhat quadrangular shape with rounded corners and exhibits a small mucronate-like projection in the middle of its lateral margins. Further, we find in the specimen that frontal avicularia are directed upwards,—not obliquely downwards as in *C. lata*.

12. *Caberea darwinii* Busk.

Caberea darwinii, Busk 1884, Chall. Rep., vol. X, pt. XXX, 29, pl. xxxii, fig. 6.—McCoy 1887, Prod. Zool. Vict., decade XIV, 141, pl. cxxxvii, figs. 1 & 5.—Waters 1898, Journ. Linn. Soc., XXVI, 10, pl. i, figs. 13, 21–25.

There exists in the collection a moderately large colony which may be identified with the above species. It was obtained from a depth of 100 fms. at Yodomi in the Sagami Sea. In this specimen, there always exists a single oral spine on the outer side of each zoöcium, instead of two as in the specimens hitherto known.

13. *Caberea megaceras*, n. sp.

Pl. VI., fig. 5; textfig. 5.

Zoarium a flabellate tuft, 25–50 mm. high, with delicately textured surface. Branches dichotomously dividing at rather wide intervals. Zoöcia biserially arranged, elongate, nearly uniformly wide throughout length; their aperture orbicular, occupying about half the front of zoöcium, with broad, minutely granulated and outwardly recurved margin; the margin armed with four spines, of which three are at the upper outer angle and one on the upper inner. Scutum ovate. Lateral avicularia wanting. Frontal avicularia dimorphic: on zoöcium partially covered over by the oöcium of the next lower zoöcium, the avicularium is usually small and is turned to one side of the aperture, with the triangular mandible directed upwards; while on freely exposed

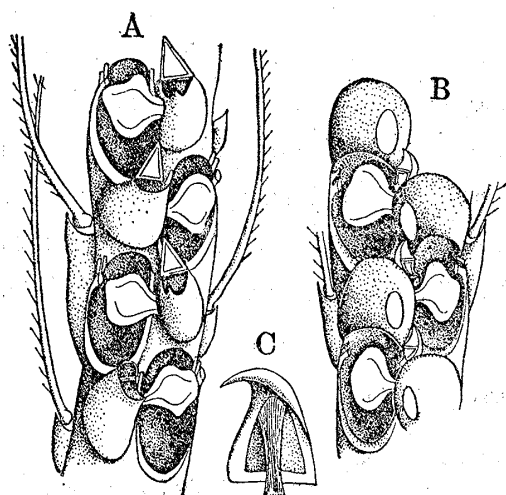


Fig. 5. *Caberea megacereas*, n. sp.

- A. Frontal view, showing large frontal avicularia. $\times 32$.
 B. Frontal view, showing small frontal avicularia and oecia. $\times 32$.
 C. Mandible of small frontal avicularium. $\times 150$.

zoecium, the avicularium is considerably larger and is placed below the aperture with the mandible directed downwards. Vibracular appendage exhibits nearly the same feature as that of *C. lata* B. Oecia large, prominent, rounded, its summit reaching to the lower apertural margin of superjacent zoecium, smooth surfaced, the wall on one side with elliptical membranous fenestra. Root-fibres occur in the same manner as in *C. lata* B.

Three colonies of this new species exist in the collection.

Localities: Okinosé 234-312 fms.; Yodomi 78 fms. Characteristic of the species is the dimorphism of frontal avicularia. The two forms of these differ not only in size, but also in the opposite direction taken by the mandible.

14. *Caberea lata* Busk.

Caberea lata, Busk 1852, Cat. Brit. Mar. Poly., I, 39, pl. xlvii.—Busk 1852, Voy. Ratt., I, 378.—Busk 1884, Chall. Rep., vol. X, pt. XXX, 30.—Ortmann 1890, Jap. Bry., 22, pl. i, fig. 5.—Thornely 1907, Rec. Ind. Mus., vol. I, 183.

Of this species, there exist in the collection a few large and perfectly preserved colonies, besides numerous fragments. Localities: off Jōgashima 54 fms.; Meranosé 312 fms.; Yodomi 62-100 fms.; off Odawara 120 fms., in the Sagami Sea. In all the specimens, the spinous processes are situated on zoecial border. Their presence, as also that of oecia, are confined to the majority of intermarginal zoecia. The

oecium which appears to have hitherto remained unknown is of a quadrangular form with flattened and marginally thickened surface. Frontal avicularia are frequently wanting.

15. *Caberea rudis* Busk.

Caberea rudis, Busk 1852, Cat. Brit. Mar. Poly., I. 38, pl. xLvi, figs. 1, 2.—McCoy 1887, Prod. Zool. Vict., decade XIV, 137, pl. cxxxvi, fig. 1.—Busk 1884, Chall. Rep., vol. X, pt. XXX, 30.—Ortmann 1890, Jap. Bry., 23, pl. i, fig. 8.

This species is represented in the collection by numerous colonies. The localities are: off Jôgashima 80 fms., of the Sagami Sea; Senkai Bay (depth unknown) in Tsushima; Tomo (depth unknown) in Prov. Bingo; Hamajima (2 fms.) in Prov. Shima; Kanayama (3 fms.) in Prov. Kii. In all the specimens from above localities, the number of oral spines does not agree with that recorded from previously known specimens. Of them, there are generally to each marginal zoecium four or three on the outer side and two on the inner, while on intermarginal zoecia there are two of them on each side. The vibracular seta is not serrated.

16. *Caberea rudis* Busk, var. *minor*, n. var.

Pl. VI., fig. 6.

This new form occurs in the shallow water of Aburatsubo, close to the Misaki Marine Biological Station, attached on stones. The chief differences between the typical species and the form under consideration, lie in the absence of the large lateral avicularia in the latter and in the direction taken by frontal avicularia. In the present form, the frontal avicularia are directed always obliquely downwards, instead of mostly upwards as in the typical species.

Bicellariidæ Hincks 1880.

Key to the genera.

- | | |
|--------------------------|-----------------|
| 1. Colony erect | 2. |
| 1. Colony creeping | <i>Beania</i> . |

- 2. Colony unstalked *Bugula*.
- 2. Colony stalked 3.
- 3. Branches forming a tuft-like group at the upper end of stalk *Kinetoskias*.
- 3. Branches arising at rather wide intervals *Stirparia*.

Bugula Oken 1815.

Key to the species.

- 1. Zoecia biserial 2.
- 1. Zoecia multiserial 5.
- 2. Avicularia present 3.
- 2. Avicularia absent 4.
- 3. Zoecial aperture with spines *B. dentata*.
- 3. Zoecial aperture without spines *B. scaphoides*, var. *constricta*.
- 4. Zoecial aperture rounded above *B. johnstoniae*.
- 4. Zoecial aperture truncated above *B. neritina*.
- 5. Avicularia placed at base of the aperture 6.
- 5. Avicularia placed half way between base and summit of the aperture *B. pugeti*, var. *umbelliformis*.
- 6. Beak of avicularia with two rostra *B. birostrata*.
- 6. Beak of avicularia with one rostrum 7.
- 7. Zoecial aperture with robust spines, exceeding six in number *B. laxa*.
- 7. Zoecial aperture with slender spines, not exceeding six in number *B. japonica*.

17. ***Bugula birostrata***, n. sp.

Pl. VI., fig. 10; textfig. 6.

Zoarium forming a tuft of 30–65 mm. height, consisting of numerous band-like and dichotomous branches; most branches joined together by fibres arising from indefinite parts of the colony. Zoecia multiserial, slightly broader above than below, 3–5 or even 7–9 of them forming an alternately interrupted transverse row; their aperture occupying two-thirds of the front, armed with numerous spines at margin: usually 7–9 spines on the outer and 4–5 on the inner border; uppermost two spines short, inconspicuous, situated close together; the second spine on each side somewhat broadened towards end; all the remaining spines pointed at end. Frontal avicularia occurring just below lower margin of zoecial aperture, conspicuously large, with tolerably long peduncle; their mandible relatively long and distinctly curved near the sharply

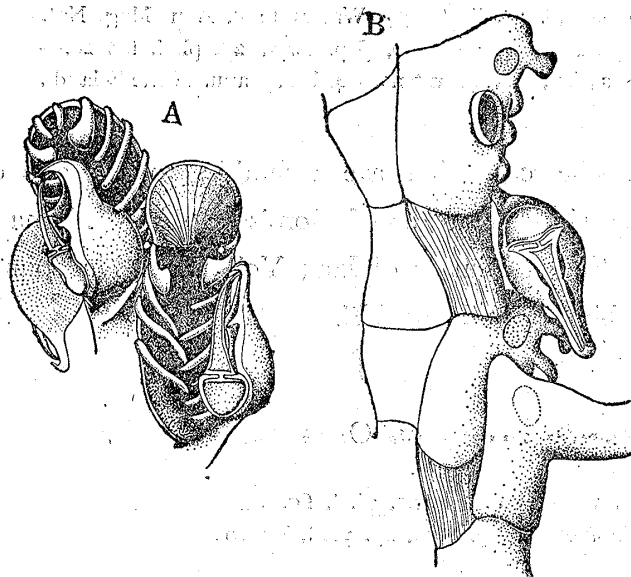


Fig. 6. *Bugula birostrata*, n. sp.

A. Frontal view. $\times 32$.

B. Dorsal view. $\times 32$.

pointed end; their beak also long and curved, with a prominent pointed tooth on each side, so that the jaws do not come in contact with each other except at the tip. There frequently exist large marginal avicularia, situated at the lower end of the outer side of marginal zoecia and turned to the dorsal side. Oöcia globose, large, with straight lower margin, marked with faint radiate striation

on the surface. Rootlets very abundant, especially in the lower parts of colony; arising from a large pore situated at the upper outer angle of marginal zoecia on the dorsal surface.

This new species is represented in the collection by numerous large colonies. They were obtained at spots in the Sagami Bay, viz., Yodomi 70–100 fms. and off Odawara 93 fms. In the habit of growth, the present species closely resembles *B. curvirostrata* R., but differs from it in the oral spines being longer, more robust and more numerous. Moreover, the two species differ in the characters of avicularia. Further, the new species somewhat resembles *B. murrayana* (J.) in the features of zoecia, but differs from it in the shape of spines as well as in the features of avicularia.

18. *Bugula dentata* (Lamouroux).

Acamarchis dentata, Lamouroux 1816, Hist. Poly. Coral. Flex., 135, pl. iii, figs. 3a, 3b.—Lamouroux 1821, Expos. Méth., 6, pl. xLv, figs. 1–3.—Blainville 1834, Man. d'Act., 459.

Bugula dentata, Busk 1852, Cat. Brit. Mar. Poly., I, 46, pl. xxxv.—McCoy 1883, Prod. Zool. Vict., decade VIII, 30, pl. lxxviii, fig. 3.—Waters 1887, Ann. Mag. Nat. Hist., 5, XX, 91, pl. iv, fig. 14.—Ortmann 1890, Jap. Bry., 25, pl. i, fig. 20.—Phillips 1899, Willey's Zool. Res., IV, 443.—Hutton 1904, Ind. Faun. Novæ-Zeland., 295.

Numerous colonies in the collection are referable to the above species. The localities are: shallow water of Moroiso; off Jôgashima; near Miyake I., one of the Seven Islands of Izu; Yokohama Harbour; Tomo in Prov. Bingo; Kushimoto in Prov. Kii.

19. *Bugula japonica* Ortmann.

Bugula japonica, Ortmann 1890, Jap. Bry., 25, pl. i, fig. 19.

Bugula hexacantha, Ortmann 1890, Jap. Bry., 25, pl. i, fig. 21.

Numerous large colonies of this species from Sagami Sea: viz., Mochiyama (depth unknown), Okinosé 312 fms., and off Jôgashima 234-312 fms. Ortmann has described *B. hexacantha* as distinct from *B. japonica*, on the ground of the former being provided with oral spines which are wanting in the latter. However, from examination of a large number of colonies, we have come to the conclusion that the presence or absence of oral spines can scarcely be made a criterion for the specific distinction, since both armed and unarmed apertures may occur in one and the same colony. Thus, in certain colonies, oral spines were found on proximal, but not on distal, zoœcia; while, in certain other colonies, the reverse was the case as regards the relative position of zoœcia with armed and unarmed aperture. *B. japonica* comes near to *B. sinuosa* B. as well as to *B. curvirostrata* R. However, it may be distinguished from the former by the presence of connecting fibres between the branches and by the elongate subquadrangular (instead of elongate-fusiform) shape of zoœcia, and from the latter by the absence of the longer avicularia and by the branches being narrower.

20. *Bugula johnstoniae* (Gray).

Halophila johnstoniae, Gray 1848, Cat. Brit. Anim.—Busk 1875, Cat. Brit. Mus. Poly., I, 43, pl. xxx.—Smitt 1872, Flor. Bry., I, 17, pl. v.

Bugula longissima, Busk 1879, Chall. Rep., vol. X, pt. XXX, 42, pl. xxxi, fig. 7.

Bugula johnstoniae, Ortmann 1890, Jap. Bry., 24, pl. i, fig. 16.

Numerous large colonies of the above species from following localities in Sagami Sea: off Niijima; off Odawara (93 fms.); Yodomi (78 fms.); Mochiyama (312 fms.).

21. *Bugula laxa* Robertson.

Bugula laxa, Robertson 1905, Univ. Calif. Pub. Zool., vol. II, 275, pl. xii, figs. 61, 62.

A few small colonies in the collection is referable to the above species. They were collected at Okinosé from a depth of 234–312 fms. The oral spines are characteristically developed. On all young, as also on all marginal, zoöcia, there are usually two spines on each side of the aperture, and those of the two sides arch over the aperture. The same spines in the older zoöcia of intermarginal rows number 3 or 4 on each side. A large number of rootlets, by means of which the colonies are attached to the substratum, arise from the outer frontal angle of proximal zoöcia on the dorsal side. The Californian specimens, on which Robertson based the species, were without avicularia; whereas, the specimens now before us exhibit avicularia on all intermarginal zoöcia, and occasionally on some marginal zoöcia also. The avicularia of marginal zoöcia are much larger than those of others. In this respect, the present species resembles *B. murrayana* (J.), but differs from it in the shape of avicularia. The species also closely agrees with *B. japonica* Ort., but there exists difference between the two in the shape of zoöcia and in the stronger apertural spines of the former.

22. *Bugula neritina* (Linnæus).

Sertularia neritina, Linnæus 1758, Syst. Nat., ed. X, 38.

Bugula neritina, Oken 1815, Lehl. der Nat., Abt. 2.—Heller 1867, Ad. Bry., 90.—McCoy 1881, Prod. Zool. Vict., decade VI, 41, pl. lix, fig. 7.—Busk 1884, Chall. Rep., vol. X, pt. XXX, 42.—Waters 1887, Ann. Mag. Nat. Hist., 5, XX, 91, pl. iv, figs. 3, 15.—Carus 1889, Prod. Faun. Médit., vol. ii, 6.—Ortmann 1890, Jap. Bry., 24, pl. i, fig. 17.—Phillips 1899, Willey's Zool. Res., IV, 440.—Robertson 1905, Univ. Calif. Pub. Zool., vol. II, 266, pl. ix, fig. 47, pl. xvi, fig. 97.—Calvet 1906, Bull. Mus. Paris, 12.—Thornely 1907, Rec. Ind. Mus., vol. I, 183.

Acamarchis neritina, Lamouroux 1816, Hist. Poly. Coral., 58, pl. iii, fig. 2.

Cellularia neritina, Johnston 1847, Brit. Zooph., 340, pl. lx, figs. 3, 4.

Very numerous colonies represented in the collection. It is quite a common species in the shallow water of the Misaki coast, found attached on submerged timber and other objects. Localities: Yokohama and Yokosuka harbours (attached to bottom of ship); Tokyo Bay; Kushimoto in Prov. Kii. The colonies are usually of a reddish brown or a dark brown colour, sometimes bearing a purple tint. Busk has given that the specimens he had of the species from Australia and Asia, were always in possession of avicularia. The same did not exist in Japanese specimens, so far as came under our examination.

23. *Bugula pugeti* Robertson, var. *umbelliformis*, n. var.

Pl. VI., fig. 8.

Bugula flabellata, Robertson 1900, Proc. Wash. Acad. Sci., vol. II, 321.

Bugula pugeti, Robertson 1905, Univ. Calif. Pub. Zool., vol. II, 271, pl. x, figs. 53, 54; pl. xi, fig. 55.

The chief difference between typical *B. pugeti* and this new variety lies in the habit of growth and in the absence of the additional spine on marginal zoecium. The zoarium consists of a number of dichotomously dividing, narrowly flabellate, frond-like branches truncate at the free end. The branches form several superiorly expanding groups, all which basally converge to the common point of origin of the branches making up the zoarium. The zoecia show on the summit a small

rounded knob, similarly as in the typical form. The rootlets arise from the dorsal surface of intermarginal zoecia in the lower parts of zoarium. They terminate each with an elliptical expansion, with which they adhere to the substratum.

This form occurs in considerable abundance in the shallow water of Aburatsubo, close to the Misaki Marine Station.

24. ***Bugula scaphoides*** Kirkpatrick, var. ***constricta***, n. var.

Pl. VI., fig. 7.

Bugula scaphoides, Kirkpatrick 1890, Ann. Mag. Nat. Hist., 6. V, 18, pl. iv.

The specimens from a depth of 350 fms. at Meranosé in the Sagami Sea seem to be a form of *B. scaphoides* K. They differ from the typical form chiefly in the existence of an indentation on the outer lateral wall of each zoecium near base, and in the shorter spinous process at the outer angle of zoecial aperture. The variety bears a strong resemblance to *B. sinuosa* Busk, but differs from it by the biserial zoecia and the pedunculated avicularia.

Kinetoskias Busk 1881.

25. ***Kinetoskias mitsukurii***, n. sp.

Pl. VI., fig. 11; textfig. 7.

Zoarium consists of an umbellate or inverted-conical crown of branches and of a long stalk. The crown, 30-40 mm. long, is made up of numerous, slender dichotomously dividing, main branches, which can be traced down to a single primary zoecium. The branches exhibit zoecia in biserial arrangement; in the preserved state they may appear to form a simple tuft, but in reality lie in a plane so rolled as to take the form of the wall of a funnel, with the primary zoecium at the apex; they are gently bent outwards at the distal end, giving the funnel a somewhat out-flaring rim. The stalk, 60-75

mm. long, is tubular with thin membranous wall; it gradually narrows superiorly from the lower attached end. At the superior end, close to the primary zoecium, the stalk lumen opens externally by an aperture; dorsally to this aperture, the stalk wall is prolonged into a narrow membranous strip. This retains the curvature of the tubular stalk wall, so that it presents a weak arc-like bending in cross-section. It is on the concave side of this membranous strip that the primary zoecium is attached, at the level of which point the strip is narrowest, being constricted on the sides, as it were. It expands above and can be traced for some distance along the bases of the dividing branches, itself dividing in the same way as these, and covering the zoecia of the parts on the dorsal side.

Zoecia oblong, nearly uniformly wide throughout the length, rounded above, with a so-called "step" on the outer border a little below the middle; with strongly convex and smooth (without trans-

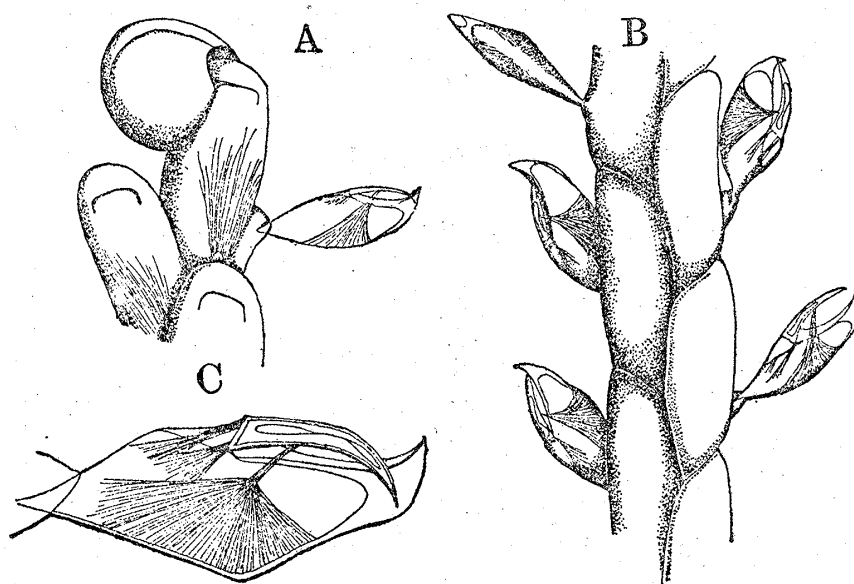


Fig. 7. *Kinetoskias mitsukurii*, n. sp.

- A. Zoecia, one of them with an oecium. $\times 25$.
- B. A small portion of a branch in dorsal view. $\times 25$.
- C. Avicularium in lateral view. $\times 75$.

verse lines) dorsal surface. The bottom of each zoöcial cell shows a small inward projection of conical shape; from its tip springs a peculiar fan-shaped muscle, about half as long as the cell or longer and inserting on the lateral and dorsal walls of the cell. The above conical projection is more strongly developed in the lower parts of branches than in the upper. Polypids with 27 or 29 tentacles. Avicularia very large, of a somewhat rhomboidal outline in lateral view; mandible acute, beak slightly arched and pointed at end; attached to zoöcium at the "step" with the narrowed and pointed base. Oöcia conspicuous, rounded, smooth, hood-like, with crescent-shaped aperture.

A few complete colonies of this new species exist in the collection. Localities: Okinose, 80 fms.; Dôketsuba, 150 fms.; off Cape Sunosaki, 120 fms. This species closely resembles *Kinetoskias cyathus* Wyv. Thomson, but distinctly differs from it, not only in the much longer size of avicularia, but also in the total absence of the spiny process at the upper outer angle of zoöcium.

Beania Johnston 1838.

26. ***Beania hexaceras*** (Ortmann).

Diachoseris hexaceras, Ortmann 1890, Jap. Bry., 26, pl. 1, fig. 30.

Numerous specimens examined, growing on seaweed. Localities: shallow water along the Misaki coast; Hamajima in the Miye prefecture. In all the specimens, many zoöcia are provided with a spine at the summit of zoöcial aperture, a fact of which no mention was made by Ortmann for the specimens he had from the Sagami Sea.

27. ***Beania magellanica*** (Busk).

Diachoris magellanica, Busk 1852, Cat. Brit. Mar. Poly., pt. I, 54.—Busk 1884, Chall. Rep., vol. X, pt. XXX, 59.—Hincks 1885, Ann. Mag. Nat. Hist., 5, XV, 246, pl. viii, fig. 2.—McCoy 1880, Prod. Zool. Vict., decade V, 32, pl. xlvii, fig. 2.

Beania magellanica, MacGillivray 1887, Cat. Mar. Poly. Vict., 17.—Waters 1897, Journ. Linn. Soc., vol. XXVI, 16, pl. ii, figs. 11-14.—Hutton 1904, Ind. Faun. Novæ-Zeland, 295.

Diachoseris magellanica, Ortmann 1890, Jap. Bry., 25, pl. i, fig. 22.

A large colony in the collection may be identified with the above species. It is attached on a specimen of *Steganoporella magnirabilis*, which came from Yodomi and a depth of 62 fms.

Stirparia Goldstein 1879.

28. ***Stirparia ciliata*** Robertson.

Stirparia ciliata, Robertson 1905, Univ. Calif. Pub. Zool., vol. II, 279, pl. xii, figs. 67-69; pl. xiii, figs. 70-71.

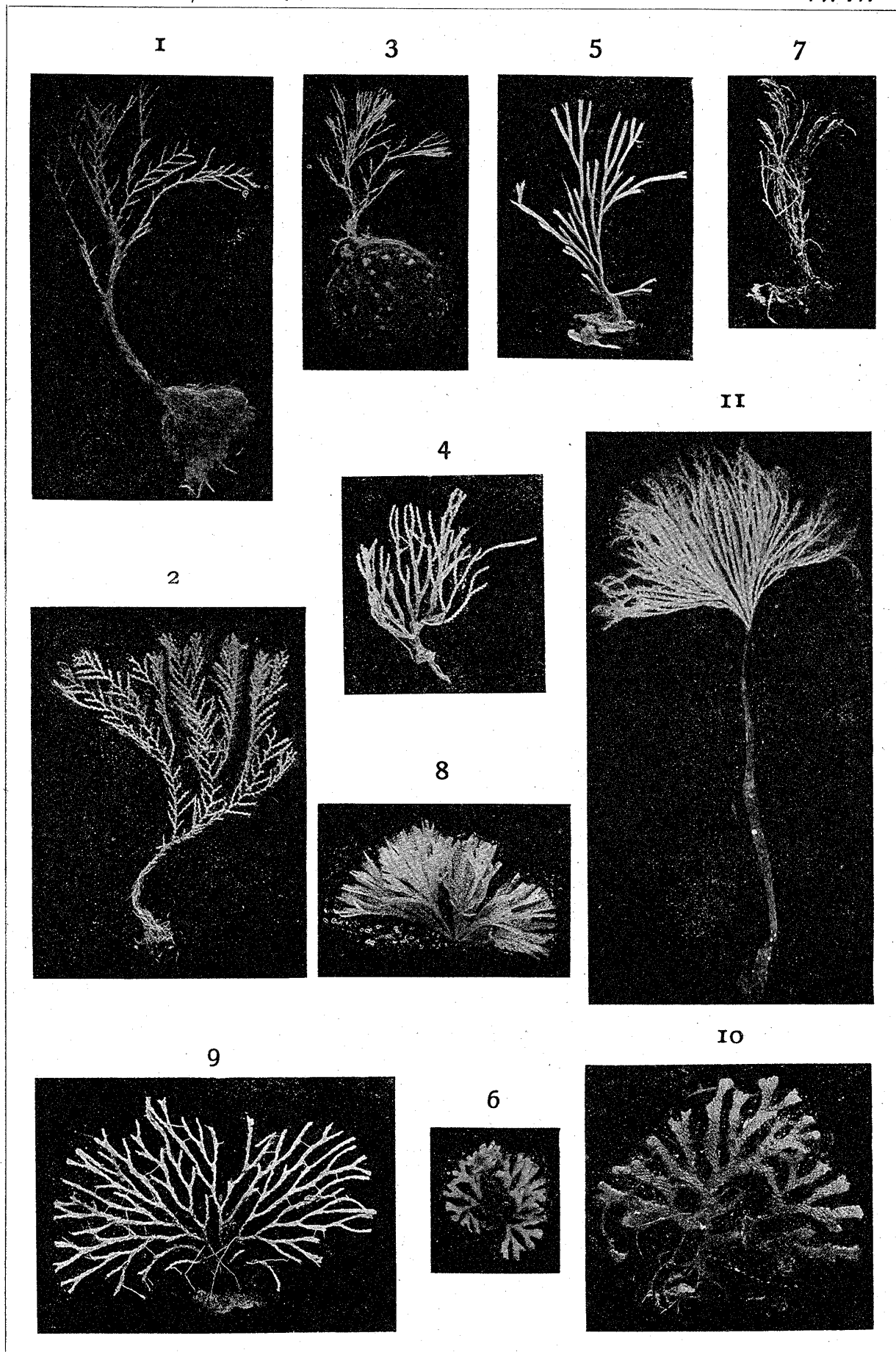
Small colonies which may be identified with the above species, exist in the collection in a few number. They were collected from shallow water at Kushimoto in the Wakayama prefecture. Compared with the description and figures given by Robertson for Californian specimens of the species, those on hand differ from them only in the much less conspicuous development of the zoarial stalk.

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Explanation of Plate VI.

- Fig. 1. *Menipea sympodia*, n. sp. $\times 1$.
Fig. 2. *Menipea sympodia*, *var. sagamiensis*, n. var. $\times 1$.
Fig. 3. *Menipea longispinosa*, n. sp. $\times 1$.
Fig. 4. *Scrupocellaria aviculariæ*, n. sp. $\times 1$.
Fig. 5. *Caberea megaceras*, n. sp. $\times 1$.
Fig. 6. *Caberea rudis*, *var. minor*, n. var. $\times 1$.
Fig. 7. *Bugula scaphoides*, *var. constricta*, n. var. $\times 1$.
Fig. 8. *Bugula pugeti*, *var. umbelliformis*, n. var. $\times 1$.
Fig. 9. *Bugula japonica* Ortmann. $\times 1$.
Fig. 10. *Bugula birostrata*, n. sp. $\times 1$.
Fig. 11. *Kinetoskias mitsukurii*, n. sp. $\times 1$.
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Yanagi and Okada: *Cheilostomatous Bryozoa*.